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DETERMINING PREDICTORS OF SUCCESS FOR THE UNITED STATES ARMY'S FULLY FUNDED GRADUATE PROGRAM

THESIS

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Daniel V. Bruno

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Abstract

This study was designed to determine predictors of success for selecting Army officers to attend fully funded graduate school. The objective was to develop prediction models to assist decision makers in selecting the best qualified officers.

The study examined the records of 1201 officers who attended fully funded graduate school during fiscal years 1982, 1983, and 1984. The officers were grouped into either administrative or academic classification categories. Administrative categories included branch, division, and source of commission, and academic categories included graduate discipline, graduate degrees awarded, and graduate school. The study examined the following predictor variables: age, gender, component, active federal commissioned service, prior enlisted or warrant officer service, undergraduate grade point average, class standing, standardized exam scores, (GRE and GMAT), and years since undergraduate degree. The criterion used for this study was graduate grade point average.

Using regression analysis, the study found different predictor-criterion relationships for each classification, as well as a few more broadly applicable predictors. Missing data due to different record-keeping procedures across branches limited the potential usefulness of the results. The

significant and meaningful predictors found should encourage career managers to improve their current procedures and begin to maintain information to permit further improvement in selection procedures as data become available.

DETERMINING PREDICTORS OF SUCCESS FOR THE UNITED STATES ARMY'S FULLY FUNDED GRADUATE PROGRAM

I. Introduction

Background

The United States Army educates officers on a full time basis at the graduate level through the Fully Funded Officer Civilian Education Program. The primary goals of the program are to establish a base of officers who possess technical skills to meet the Army's force structure requirements, convert relevant, emerging technologies to battlefield use, and satisfy officers' educational aspirations (Wixted, 1986). The Army Educational Requirements Board (AERB), with subsequent approval by the Army's Deputy Chief of Staff of Personnel, determines commissioned and warrant officer positions that require advanced educational degrees (Manning, 1986).

Justification

A fully funded school quota is a significant investment for the Army as well as the officer selected. The Army's investment includes payments for tuition, books, fees, supplies, moving expenses, pay and allowances, and the loss of operational manpower. In fiscal year 1987, the educational expenses alone (tuition, books, fees, and supplies) cost an average of $7453 per officer for a 12 month period. This

amount includes all advanced educational programs that the Army supports, since a separate figure for fully funded education was not available (Leahy, 1987). The officer's investments are time and professional aspirations.

Failing to graduate results in a loss of Army money and is potentially detrimental to the career of the unsuccessful officer. On the positive side, officers who graduate can repay the Army with their skills many times over the initial investment.

The Application Process

Officers who desire to attend fully funded graduate school submit applications in accordance with Department of the Army Regulation 621-1, Training of Military Personnel at Civilian Institutions. The normal period for attendance is between an officer's 6th and 13th year of commissioned service. The first criterion for selection is high military performance. Academic aptitude is the second criterion. Officers cannot attend a fully funded program until after they become qualified in their branch, the specialty area to which the Army assigns officers upon commissioning. Branch qualification consists of a series of assignments that demonstrate an officer's overall proficiency.

To understand the application process, some knowledge of the branch structure is necessary. The 15 officer branches, or specialties, in this study are divided into three divisions (See Table 1).

Table 1

Division/Branch Structure*

Combat Arms Division	Combat Support Division
Air Defense Artillery (AD)	Chemical Corps (CM)
Armor (AR)	Corps of Engineers (EN)
Aviation (AV)	Military Intelligence (MI)
Field Artillery (FA)	Military Police Corps (MP)
Infantry (IN)	Signal Corps (SC)

Combat Service Support Division
Adjutant General's Corps (AG)
Finance Corps (FI)
Ordnance Corps (OD)
Quartermaster Corps (QM)
Transportation Corps (TC)

* The medical, legal, and religious branches are specialty branches and, as such, are managed under a different system and not included in this study.

The application process is not standard across the three divisions. Review boards may meet at the branch level, the division level, or both. Recently, a validation board at the Officer Personnel Management Directorate (OPMD) level (one level above the divisions) was established to make a final determination on the division's recommendations. The general application process is described below.

The applicant's branch reviews the application and makes a determination on whether or not military and academic performance merit graduate school consideration. The branch can recommend approval to the division, disapprove the application, or hold the application for future consideration for potential, but not-yet-ready, candidates.

Before forwarding a recommended application to the division, the branch discusses potential schools and academic disciplines with the applicant. Depending on the quotas available, the applicant will attend an Army-designated school and program, choose one of three Army-selected schools and programs, or submit the name of a school that offers in-state tuition and a program of interest to the Army. At this point, the applicant must apply and be accepted by the agreed-upon school.

Next, some divisions convene a board to review the applications recommended by the branches, selected schools and programs, and undergraduate transcripts. In most cases, the divisions support branch recommendations. Lastly, the divisions forward their recommendations to the OPMD board for a final determination.

Problem Statement

Reviewing applications for fully funded graduate school requires the analysis of many variables. The decision makers need to know which variables are important in the selection process. Numerous studies have researched various graduate school predictors and their success. Until now, the Army has not had the benefit of such a study.

The purpose of this study is to determine predictors of success for selecting Army officers to attend fully funded graduate school. The results of this study will be of interest to the Army career managers who make the decisions on

graduate attendance, the potential applicants, and the taxpayers whose money supports the investment.

Definition of Terms

Branch - the specialty area to which the Army assigns officers upon commissioning (e.g., Infantry, Military Police, Aviation, Corps of Engineers, etc.).

Criterion variable - the outcome a study attempts to predict. Note that the use of "criterion variable" in this study is different from the more common use of criterion as an identifying characteristic, as in "selection criterion." The selection "criteria" in this study are predictor variables (See below).

Predictor variables - those elements within an officer's file that may contribute to predicting success.

Reliability - the degree of consistency with which tests measure what they are supposed to measure.

Success - completion of degree requirements within the Army's specified time.

Test - ". . . all procedures for collecting data, including observations . . ." (Cronbach, 1971, p. 443).

Validity - how well a test measures what it is intended to measure.

Scope of the Study

This study includes commissioned officers who began fully funded graduate school programs (excluding the medical, legal, and religious programs) during fiscal years 1982, 1983, and

1984. This sample consists of 1201 officers. Complete data on every officer were not available because information files on some officers were not accessible. Some files were signed out to other agencies for personnel actions or selection boards, and some files no longer existed because the officers left the service.

This study limited the potential predictor variables to those variables present in the officers' graduate school applications and career management information files. Because the officer evaluation system is not easily quantifiable, this study did not attempt to evaluate military performance as a variable.

Literature Review

This section summarizes the findings of the literature search. Specifically, this section examines reliability, validity, criteria, predictor variables, classification of the population, and statistical methods for prediction models.

Reliability. Reliability refers to the degree of consistency with which tests measure what they are supposed to measure. Stanley (1971) stated, "The accuracy of prediction that is possible to achieve is limited by the reliability of the measure through which the performance is manifested" (p. 358). It is necessary to ensure the predictors and criteria are reliable in order to accurately interpret the degree of correlation between the predictors and criteria (Stanley, 1971).

Guion (1965) defined the concept of reliability as, ". . . the extent to which a set of measurements is free from random-error variance" (p. 30). A reliability coefficient provides an estimate of what proportion of the total variance is attributable to random chance and what proportion of the variance is attributable to the actual differences in the characteristics being examined (Anastasi, 1982). For example, if the reliability coefficient, also called the coefficient of determination, is .94, than 94 per cent of the total variance is the result of differences in the characteristics under examination, and the remaining six per cent variance is the result of chance error.

The reliability coefficient will vary depending on the individual differences and different ability levels within the sample (Anastasi, 1982). The more alike the sample, the closer the correlation will be to zero.

Validity. Where reliability deals with the consistency of a measurement, validity deals with the soundness of a measurement. The validation process is the process of investigating how well a test measures what it is supposed to measure.

Anastasi (1982) and Cronbach (1971) described three categories of procedures for investigating test validity: content, criterion-related, and construct validity. Criterion-related validation is the procedure applicable to prediction. The two areas of criterion-related validation are

concurrent validation and predictive validation. The difference between these two areas is based on the objectives of the test. Concurrent validation is relevant in investigating the existing status. Predictive validation is relevant in examining decision rules for the future. Cronbach (1971) emphasized that "Validity for decision making is not established by concurrent study" (p. 484).

After determining the appropriate validation process, it is necessary to determine how to quantifiably measure validity and how to express this measurement. The validity coefficient provides a numerical validity index which demonstrates the correlation between the test and the criterion (Anastasi, 1982). The validity coefficient is calculated for continuous variables using the Pearson Product-Moment Correlation Coefficient. This coefficient is generally greater than zero and less than one, but can fall anywhere between negative one and positive one. The closer the validity coefficient is to one, the greater the positive relationship. In contrast, the closer the validity coefficient is to negative one, the greater the negative relationship. A negative validity coefficient is equally as predictive of success as a positive coefficient of the same numerical value.

A common question in using validity coefficients is what the level of significance should be for the correlation (Anastasi, 1982). Most researchers in this study used a .01 or .05 level of significance. For example, finding a validity

coefficient to be significant at the .05 level means the chance that the relationship is incorrect is only 1 in 20 (i.e., 5%).

Anastasi (1982), Traxler (1952), and Womer (1968) agreed the validity coefficient for samples or populations of students with relatively similar academic abilities will generally be less than .60. Anastasi (1982) believed a satisfactory validity coefficient may be as low as .20 or .30. Traxler (1952) supported a .50 level, and Womer (1968) generally viewed a validity coefficient below .60 as meaningful.

These relatively low validity coefficients are a result of the homogeneity, or similarities, of the population. Furst (1950) provided a good explanation of this concept known as "restriction in range." Furst (1950) explained:

> Validity coefficients increase when a test is used on a group with a wide range of aptitude, and decrease when the test is used on a relatively homogeneous, preselected group. Since many students of relatively low aptitude are refused admission to professional schools, the group finally admitted is always more homogeneous in aptitude than the complete group of applicants. (p. 650)

Before any data collection begins, the researcher must determine the size of the sample necessary to ensure an adequate study. Guion (1965) offered a formula reported by McHugh in 1957 that depends on the significance level and the acceptable deviation from the population correlation coefficient. After an analysis of McHugh's formula, Guion (1965) summarized, "In short, the rule in validation research is to get as many cases as possible" (p. 126).

Criteria. The outcomes a study attempts to predict are called the criteria. Furst (1950) and Hartnett and Willingham (1979) discussed the problems associated with defining the proper set of criteria for selecting successful candidates for graduate education. They agreed on two broad criterion measures. The first is success in graduate studies; the second is the graduate's subsequent professional accomplishments. The two articles agreed that each criterion is difficult to measure. Graduate studies are easier to quantify because of grades, but grades have their weaknesses. One problem with grades is that they do not provide specific strengths nor weaknesses in a particular area, but only an average. Another problem with grades is that grades may be a result of ability or the result of the amount of effort exerted. Tests are capable of measuring ability or aptitude, but not motivation.

Using indicators such as professional activities, publications, and experience in a graduate's subsequent occupation has the most relevance and significance to that which is being measured, but such indicators are seldom used, because they are the most difficult to quantify (Furst, 1950, and Hartnett & Willingham, 1979).

The most common criterion was graduate grade point average (GGPA) (Baird, 1975; Borg, 1963; Camp & Clawson, 1979; Jenson, 1953; Madaus & Walsh, 1965). The combination of GGPA and faculty ratings was also used frequently when the study

was limited to only one school (Federici & Schuerger, 1974; Martson, 1971; Platz, McClintock, & Katz, 1959; Thacker & Williams, 1974). Borg (1963) cautioned users of GGPA as the criterion, because graduate level grades are usually limited to the A to B range. Fortunately, the cumulative grade point average imposes somewhat more range and variance.

Predictor Variables. The predictor variables of interest to this study and supported by the literature are divided into four categories: biographic, military, undergraduate, and standardized exams. Table 2 summarizes which studies included which variables as predictors. The listing reveals that most of the validity studies used undergraduate grade point average (UGPA) and standardized exam results as primary predictors.

Table 2

Literature-supported Predictor Variables for Graduate School

Biographic

Age

Edwards and Walters (1980)
Graduate Management Admission Council (GMAC) (1985) - 25 schools
Humphrey (1983)

Gender

Baird (1975)
Covert and Chansky (1975)
Edwards and Walters (1980)
Mehrabian (1969)
Payne, Wells, and Clarke (1971)

Race

Baird (1975)

Table 2 (Continued)

Literature-supported Predictor Variables for Graduate School

Military

Active Federal Commissioned Service

Van Scotter (1983)

Enlisted Years of Service

Van Scotter (1983)

Source of Commission

Humphrey (1983)

Undergraduate

Institution

GMAC (1985)
Humphrey (1983)

Discipline

Baird (1975)
GMAC (1985) - 10 schools
Humphrey (1983)

Grade Point Average

Baird (1975)
Covert and Chansky (1975)
Federici and Schuerger (1978)
GMAC (1985) - 111 schools
Humphrey (1983)
Jenson (1950)
Lin and Humphreys (1977)
Mehrabian (1969)
Payne et al. (1971)
Robertson and Nielsen (1961)
Van Scotter (1983)

Class Rank

Edwards and Walters (1980)

Table 2 (Continued)

Literature-supported Predictor Variables for Graduate School

Standardized Test Scores

Graduate Record Exam (GRE)

With the exception of Covert and Chansky (1975), GMAC (1985), and Jenson (1953), all of the studies that used UGPA as a predictor also used GRE. Two additional studies that examined the GRE were Borg (1963) and Camp and Clawson (1979).

Graduate Management Admissions Test (GMAT)

Federici and Schuerger (1978)
GMAC (1985) - 111 schools
Humphrey (1983)
Van Scotter (1983)

Undergraduate grade point average (UGPA) and GRE scores warrant additional discussion because they are the most popular variables used as graduate school selection criteria. Although UGPA and GRE scores are popular predictor variables, the literature is divided on their predictive value.

Baird (1975) discovered that the overall UGPA was a more valid predictor of graduate success than grades in particular majors, except for the biological and physical sciences. He also concluded that grades were better predictors of success than GRE scores.

While Federici and Schuerger (1978) determined GRE scores and UGPA were significant but modest predictors of GGPA, Payne, et al. (1971) determined mixed results in that GRE scores were better predictors for some programs, and UGPA predicted success better for other programs.

Oltman and Hartnett (1984) reported that approximately 64 per cent of all graduate programs require applicants to provide GRE scores. Even though a majority of programs use GRE scores, Madaus and Walsh (1965) advised graduate school admission offices that GRE scores provide very little predictive information when used as a variable in a regression model. Oltman and Hartnett (1984) suggested the use of GRE scores primarily when other applicant credentials appear to be weak.

Lin and Humphreys (1977) and Burton and Turner (1983) agreed that GRE scores and UGPA are significant variables for predicting graduate school success, but only in the first year. They found the correlation of GRE and UGPA to GGPA to be higher in the first year than the second. They suggested that this is true because the intellectual challenge is greater the first year. As students adjust to the academic environment, the challenge is more manageable. Chronbach (1970) also discussed lower correlations over time, and cautioned that, "Tests that predict short-term criteria may have limited long-run validity, and vice versa" (p. 415).

Finally, Clark (1984) researched another effect time has on the predictive value of GRE scores. Because most Army officers do not attend graduate school until after they have completed six years of service, time between undergraduate degree completion and admission to graduate school would appear to have some effect on success. Clark (1984) examined

200,000 GRE test takers and found that the verbal score did not significantly differ between test takers who were age 30 and older and test takers who were 20-22 years old. These verbal scores also had similar predictive ability for first year graduate grades. Clark did note that the quantitative results were lower for the older group, probably because of a lack of practice. Clark also discovered that UGPAs for the older group (30 and older) were lower than those of the younger group (20-22 years), but the older group's UGPA as a success predictor was not as useful as the younger group's UGPA.

Classification of the Population. Baird (1975), Covert and Chansky (1975), Jenson (1953), Madaus and Walsh (1965), and Travers and Wallace (1950) determined the need to classify a population of students according to various areas.

Jenson's (1953) study concluded that it is unrealistic to predict academic performance for a general group of graduate students who are pursuing degrees in various areas. Instead, he recommended classifying the students according to abilities since standards may vary from one group to another.

Madaus' and Walsh's (1965) findings supported Jenson's earlier study that classifying provided statistically significant correlations between GRE scores and GGPA. Consequently, when they grouped academic departments as one classification, they concluded grouping in this manner provides limited information and should not be used.

Baird (1975) believed previous studies that predicted graduate level performance in only one area were limited in scope. Consequently, he compared performance predictors for six postgraduate fields and determined some unique patterns across the categories of classification, as well as specific predictors for individual areas (See also, Van Scotter, 1983).

Covert and Chansky (1975) classified students according to gender and on the basis of low, moderate, and high UGPA.

Finally, Travers and Wallace (1950) concluded, ". . . there are great differences between the areas of study in the abilities associated with grades" (p. 376).

Statistical Methods for Prediction Models. After choosing the predictor variables and the performance criteria, the researcher must integrate these data into a statistical model that will ultimately provide predictive information. This study reviewed many studies which included an outline of the methods used for building predictive models. Most of these studies used correlation matrices to determine the strongest correlation between the predictor variables, and some form of stepwise multiple regression analysis to correlate the predictors with the criteria (Baird, 1975; Federici & Schuerger, 1974; Jenson, 1953; Madaus & Walsh, 1965; Mehrabian, 1969; and Van Scotter, 1983).

The correlation matrix indicates a measure of the strength of the linear relationship between two variables. A high correlation does not imply one variable causes the other

variable to react. A high correlation simply suggests a linear trend may exist between the two variables.

Stepwise multiple regression systematically adds predictor variables to a model that contribute to prediction. Stepwise multiple regression also eliminates those variables that are not as useful. The stepwise procedure begins examining all one variable models and subsequently adds the remaining variables to determine which combination best fits the criterion.

Summary

The Army can maximize its return on investment in fully funded graduate school programs by ensuring its selection criteria are reliable and valid. The literature reveals the foundation for this type of study is solid and time-tested. The following chapters will contribute to ensuring the Army's selection process is as reliable and valid as it can be.

Investigative Questions

(1) What percentage of Army officers who started fully funded graduate programs during fiscal years 1982, 1983, and 1984 successfully completed them?

(2) What were the selection criteria?

(3) Did all of the officers meet the selection criteria?

(4) What other likely predictors for success in an officer's record are not included in the Army's selection criteria?

(5) What are the best predictors for success in an officer's records?

(6) Are there predictors which are more accurate for specific programs?

II. Method

Introduction

This chapter describes the methods used in the study. The subjects were identified, and criterion and potential variables to predict the criterion were defined and collected. After the data collection, the variables were categorized to provide the maximum benefit to the Army. Once categorized, a statistical analyses provided the information necessary to complete this research.

Subjects

The sample used in this study consisted of officers who began fully funded graduate school during fiscal years 1982, 1983, and 1984. The size of the sample was 1201 officers. Table 3 provides a profile of these officers according to gender, race, division, source of commission, component, and graduate program. Table 4 provides the mean, standard deviation, and minimum and maximum values of the variables observed in this study. Profiles and means for the individual branches are in Appendix A.

Table 3

Profile of the Army's Fully Funded Graduate School Program (Fiscal Years 1982, 1983, and 1984)

PROFILE	SAMPLE SIZE	% OF OFFICERS
GENDER		
FEMALE	44	3.7
MALE	1157	96.3
MISSING	0	
RACE		
CAUCASIAN	1107	92.2
HISPANIC	18	1.5
NEGRO	47	3.9
OTHER	29	2.4
MISSING	0	
DIVISION		
COMBAT ARMS	550	45.8
COMBAT SUPPORT	429	35.7
COMBAT SERVICE SUPPORT	191	15.9
FUNCTIONAL AREA*	31	2.6
MISSING	0	
SOURCE OF COMMISSION		
OFFICER CANDIDATE SCHOOL	81	6.8
RESERVE OFFICER TRAINING CORPS	500	42.0
UNITED STATES MILITARY ACADEMY	573	48.2
OTHER	36	3.0
MISSING	11	
COMPONENT		
REGULAR ARMY	980	82.4
OTHER THAN REGULAR ARMY	210	17.6
MISSING	11	
GRADUATE DISCIPLINE		
BUSINESS	265	22.0
ENGINEERING	487	40.5
HUMANITIES	80	6.7
PHYSICAL SCIENCES	67	5.6
SOCIAL SCIENCES	300	25.0
OTHER	2	.2
MISSING	0	

* These officers are single-tracking in their functional area. This means that their secondary specialty area was awarded in place of their branch, because they are going to stay in that area for the remainder of their careers.

Table 4

Variable Means

VARIABLE	SAMPLE SIZE	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
AGE (yrs)	1183	30.85	2.75	22.00	48.00
AFCS (mons)	1185	92.71	27.38	1.00	276.00
PSVC (mons)	1188	3.80	12.21	0.00	114.00
UGPA (4.0)	1009	3.05	0.47	1.76	4.00
UPRCT	284	66.95	23.65	7.00	93.00
GREV	333	546.52	91.00	310.00	800.00
GREQ	332	641.96	96.74	290.00	800.00
GREA	194	585.67	96.90	370.00	800.00
GRET	332	1188.37	155.03	630.00	1570.00
GMATV	71	31.94	6.42	16.00	45.00
GMATQ	71	32.01	6.58	17.00	50.00
GMATT	74	533.36	78.58	345.00	740.00
OUT (yrs)	1071	7.84	2.23	0.00	23.00
GGPA (4.0)*	1005	3.57	0.32	1.75	4.00

* Transcripts were not available for the officers who failed. This study developed a relative frequency to approximate the 22 GGPA for the failures (Schmidt and Hunter, 1977).

Criterion

Graduate academic performance as measured by the cumulative grade point average after graduation is the most appropriate criterion for this study (Furst, 1950, and Hartnett & Williams, 1979). Although the literature suggested post-graduate school job performance to be the most useful criterion (Furst, 1950, and Hartnett & Williams, 1979), the collection of this criterion was beyond the scope of this study since, in most cases, such data are not yet available.

Predictor Variables

Table 5 outlines the five categories of potential predictor variables collected for this study. This study converted applicable variables to what they were at the start date of graduation.

As discussed in the first chapter, the literature supports using most of these variables, because they are the most common. The only variables this study did not find in previous research efforts were those variables unique to the military: branch, component, and Distinguished Military Graduate (DMG). All of these have a logical basis for including them as predictor variables.

The branch is the specialty area to which the Army assigns officers upon commissioning. It may be possible that some of the more technical branches (Corps of Engineers, Chemical Corps, Finance Corps, etc.) have a higher success

Table 5

Potential Predictor Variables Collected

Biographic Data

age
gender
race

Military Data

branch
active federal commissioned service (AFCS)
distinguished military graduate (DMG)
enlisted and Warrant Officer years of service
component: Regular Army (RA) or other than RA (OTRA)
source of commission (SOC):
    Officer Candidate School (OCS)
    Reserve Officer Training Corps (ROTC)
    US Military Academy (USMA)
    Other

Undergraduate Data

undergraduate school (USCH)
undergraduate discipline (UDISC)
undergraduate grade point average (UGPA)
undergraduate class standing (UPRCT) - as a percentile

Standardized Test Scores

Graduate Record Exam (GRE) scores:
    GRE verbal score (GREV)
    GRE quantitative score (GREQ)
    GRE analytical score (GREA)
    GRE total score (GRET) = GREV + GREQ
Graduate Management Admission Test (GMAT) scores:
    GMAT-verbal (GMATV)
    GMAT-quantitative (GMATQ)
    GMAT-total (GMATT)

Graduate Data

graduate school (GSCH)
graduate discipline (GDISC)
graduate degree awarded (MDG)
time between completion of undergraduate degree and admission to graduate school (OUT)

rate in graduate school than the less technical branches (Infantry, Armor, Field Artillery, etc.).

An officer's component is either Regular Army (RA) or other than RA (OTRA). Congress has set ceilings on the number of RA officers. It is therefore a competitive process prior to the rank of Major. Every officer selected for promotion to Major has the option of becoming RA. Because it is a competitive process, those selected for RA may have more potential for success in graduate school.

In order to be designated as a DMG, an officer must be the top graduate in his/her ROTC, OCS, or Military Academy class. Once again, because this process is a competitive process, it may be a potential predictor.

Data Collection

Data was collected during three weeks of temporary duty (funded by the Air Force) to the Army's Military Personnel Center (MILPERCEN) in Alexandria, Virginia.

Determining which officers were in the sample required screening automated and manual file systems. Next, the officers were categorized according to their branch. The officer files represented by each of the 15 branches were located in 15 separate offices. An automated Officer Master File provided data for the majority of variables. Since standardized exam scores and data available only on transcripts were not automated, a manual screen was necessary. The majority of the files did not contain standardized exam

scores since the Army does not require their filing. Other missing data are due to unavailable records.

During the data collection, thousands of calculations were necessary in order to put the data into an acceptable format for the statistical analysis. All grade point averages were converted to a 4.0 scale, dates of birth to age at time of admission, current component to component at time of admission, and class ranks to class percentiles. Calculations of years between undergraduate degree and start of graduate school, active federal service minus active federal commissioned service, and total GRE scores were also necessary.

Categories of Classification

This study examined several ways to classify the data based on the findings of previous research efforts (See Chapter one). For the purposes of this analysis, there are two general categories of classification, administrative and academic. Table 6 lists the categories of classification used in this study.

The administrative classification categories consist of specific areas within the Army's military personnel system. The first specific area is a composite of the sample prior to classification. The second and third administrative classifications, branch and division, are the structures within which career managers monitor the careers of the officers. Classifying the sample according to source of

commission may provide some insight on whether or not educational backgrounds and how officers obtained their commissions effect graduate success.

The academic classifications examine specific undergraduate and graduate categories of classification. Some undergraduate disciplines may better prepare officers for graduate school. Classifying according to graduate school may reveal different selection standards to be appropriate for certain schools. The same logic follows for graduate discipline. Classifying according to graduate degree awarded examines graduate disciplines in another perspective.

Table 6

Categories of Classification

I. Administrative

A. Composite (entire sample without classification)

B. Branch (See Table 1 for the 15 branches)

C. Division (See Table 1 for the structure)
   1. Combat Arms
   2. Combat Support
   3. Combat Service Support

D. Component
   1. Regular Army
   2. Other than Regular Army

E. Source of Commission
   1. Officer Candidate School
   2. Reserve Officer Training Corps
   3. United States Military Academy
   4. Other

Table 6 (Continued)

Categories of Classification

II. Academic

A. Undergraduate Discipline (as classified in AR 680-29)
   1. Business
   2. Engineering
   3. Humanities
   4. Military Academy (unspecified USMA disciplines)
   5. Physical Sciences
   6. Social Sciences

B. Graduate School*
   1. Federal (Naval Post-Graduate School and Air Force Institute of Technology)
   2. State (Florida, Illinois, Indiana, N. Carolina State, N. Carolina, S. Carolina, Texas, Penn State, Virginia, Texas A&M)
   3. Select (Stanford, Georgia Institute of Technology, MIT, Rensaler Poly-Technical Institute, Harvard, California-Berkley)
   4. Syracuse (the Army Comptroller Program)
   5. Other (schools not listed above)

C. Graduate Discipline (as classified in AR 680-29)
   1. Business
   2. Engineering
   3. Humanities
   4. Physical Sciences
   5. Social Sciences

D. Graduate Degree Awarded
   1. Master of Business Administration
   2. Master of Science
   3. Master of Arts

* The sample included 170 graduate schools. The 19 schools identified above represent the most popular schools. These schools accounted for 61 per cent of the schools used by the Army's Fully Funded Program during fiscal years 1982, 1983, and 1984. The "Select" category is based on sample size and this researcher's opinion.

Statistical Analyses of Data

Once the data set was properly formatted, the next step was writing a program using the statistical package, Statistical Analysis System (SAS). The SAS program examined four particular areas: frequency distributions, means, correlation matrices, and stepwise regression.

Frequency distributions helped build profiles of the samples and checked data consistency. Information such as Table 3 and Appendix A are the result of frequency distributions. The frequency distribution also facilitated the identification of out-of-range values caused by errors when loading the data base.

The purposes of means, or averages, in the program were to provide decision makers with information about previous predictor variables and a guide to what expectations can be for the future. Table 4 and Appendix A are the result of the mean function.

The correlation matrices provided the significance and strength of of the linear relationship between the criterion variable, GGPA, and the predictor variables identified in Table 5. Correlation matrices are only useful for for quantifiable variables (e.g. age, UGPA, standardized exam scores, etc.). Unless a qualitative variable has only two choices, correlation matrices are not useful. The following qualitative variables have two responses: gender (male/female) and component (RA/OTRA). In order to use these as predictor varibles in the correlation matrices, male and RA

responses were substituted with one and and female and OTRA responses were substituted with two. Correlation matrices important to this study are examined in the next chapter and in Appendix B.

The final phase of the analysis was developing prediction models using stepwise regression. The stepwise regression procedure calculates a model only for variables without missing data. For example, if some officers' GRE scores were not available, then all of the data on those officers were excluded in the model. The final models included only predictor variables that met a .15 significance level.

The prediction models in this study are presented in tables for the purpose of computing a prediction of the GGPA. The formula to calculate the predicted GGPA (PGGPA) is:

$$\text{PGGPA} = \text{CONSTANT} + \text{PREDICTOR VALUES (WEIGHT)} \quad (1)$$

Using the prediction model in Table 11 as an example:

$$\text{PGGPA} = 3.60127889 + \text{UGPA}\ (0.07373968) - \text{AGE}\ (0.01388346) + \text{OUT}\ (0.02408828) \quad (2)$$

If the applicant's UGPA was 3.20, age was 29, and years since undergraduate degree were 7, than, the GGPA prediction is 3.603;

$$3.603 = 3.60127889 + 3.20\ (0.07373968) - 29\ (0.01388346) + 7\ (0.02408828) \quad (3)$$

Summary

T. chapter provided an explanation of the methods used to complete this study. The results of the correlation matrices and the predictive models are provided and discussed in the following two chapters.

III. Results

Introduction

In this chapter, the results of the study are presented in the form of correlation matrices and prediction models. Selected matrices and models will appear in this chapter. The remainder will appear in the appendices.

Correlation Matrices

Correlation matrices using GGPA as the criterion were calculated for all of the predictor variables in each of the classifications outlined in the previous chapter (See Table 6). Because data on all of the the predictor variables were not available, the sample sizes differ. Only predictor variables that were significant at the .10 level and below are included in the correlation tables. Table 7 shows the significant correlation coefficients for the predictor variables prior to classification. AFCS, UGPA, UPRCT, GMATQ, GMATT, and OUT have positive correlation coefficients. This means that these predictor variables have a direct linear relationship with the criterion, GGPA. In general, the more commissioned service (AFCS) officers had prior to graduate school, the higher was their GGPA. Similarly, the longer the period of time between the officers' undergraduate degrees and the start of graduate school (OUT), the higher was their GGPA.

Table 7

Correlation Matrix for all Categories (N = 1201)

VARIABLE	CORRELATION	SAMPLE SIZE	SIGNIFICANCE
AFCS	.058	994	.069
PSVC	-.056	996	.079
COMP	-.097	1005	.002
UGPA	.101	974	.001
UPRCT	.141	277	.019
GMATQ	.314	68	.009
GMATT	.203	71	.090
OUT	.061	979	.056

Table 7 also reveals that when reviewing undergraduate transcripts, the higher the UGPA and class standing (UPRCT) were, the more likely the officer achieved a higher degree of success in graduate school. Likewise, the higher an officer's GMATQ and GMATT scores were, the higher was the GGPA

Finally, Table 7 reflects modest, negative correlations for PSVC and COMP. This suggests that, in general, officers with prior enlisted or warrant officer service (PSVC) or other than Regular Army (RA) commissions (COMP), were not as successful in graduate school as officers with no prior service or RA appointments.

The correlation matrix in Table 7 is a general picture of the Fully Funded Graduate Program. More useful matrices for the decision makers are the following matrices calculated according to the classifications in Table 6.

The correlation matrices for the 15 branches grouped according to their respective divisions (outlined in Table 1) are in Table 8. Table 9 provides the correlation matrices for the graduate disciplines. Table 10 shows the correlation matrices classified according to graduate degrees awarded. The correlation matrices classified according to branch, source of commission, graduate school, component, and undergraduate discipline are in Appendix B.

Table 8

Correlation Matrices for Divisions

DIVISION: COMBAT ARMS (N = 550)

VARIABLE	CORRELATION	SAMPLE SIZE	SIGNIFICANCE
COMP	-.077	474	.093
UGPA	.080	456	.088
UPRCT	.192	158	.016
GREV	.177	140	.037

Table 8 (Continued)

Correlation Matrices for Divisions

DIVISION: COMBAT SUPPORT (N = 429)

VARIABLE	CORRELATION	SAMPLE SIZE	SIGNIFICANCE
AFCS	.162	349	.002
UGPA	.123	342	.023
GREV	-.141	143	.092
GRET	-.163	143	.051
OUT	.123	338	.024

DIVISION: COMBAT SERVICE SUPPORT (N = 191)

VARIABLE	CORRELATION	SAMPLE SIZE	SIGNIFICANCE
AFCS	.145	160	.067
PSVC	-.164	160	.038
GMATQ	.330	38	.043
GMATT	.277	40	.083
OUT	.177	160	.025

Table 9

Correlation Matrices for Graduate Disciplines

GRADUATE DISCIPLINE: BUSINESS (N = 265)

VARIABLE	CORRELATION	SAMPLE SIZE	SIGNIFICANCE
GENDER	-.139	226	.037
AFCS	.122	224	.068
PSVC	-.135	224	.043
COMP	-.128	226	.056
GMATQ	.288	59	.027
OUT	.129	222	.055

GRADUATE DISCIPLINE: ENGINEERING (N = 487)

VARIABLE	CORRELATION	SAMPLE SIZE	SIGNIFICANCE
GENDER	-.086	404	.084
UGPA	.256	393	.001
UPRCT	.291	141	.001
GREQ	.141	179	.060
GREA	.207	99	.040
GRET	.122	179	.104

Table 9 (Continued)

Correlation Matrices for Graduate Disciplines

GRADUATE DISCIPLINE: HUMANITIES (N = 80)

VARIABLE	CORRELATION	SAMPLE SIZE	SIGNIFICANCE
GENDER	.251	62	.049
COMP	-.253	62	.047

GRADUATE DISCIPLINE: PHYSICAL SCIENCES (N = 67)

NO CORRELATIONS WERE SIGNIFICANT FOR PHYSICAL SCIENCES

GRADUATE DISCIPLINE: SOCIAL SCIENCES (N = 300)

VARIABLE	CORRELATION	SAMPLE SIZE	SIGNIFICANCE
PSVC	-.179	250	.005
COMP	-.133	253	.035

Table 10

Correlation Matrices for Graduate Degrees Awarded

GRADUATE DEGREE: MASTER OF BUSINESS ADMINISTRATION (N = 111)

VARIABLE	CORRELATION	SAMPLE SIZE	SIGNIFICANCE
PSVC	-.204	99	.043
GMATQ	.392	40	.013
OUT	.260	99	.010

GRADUATE DEGREE: MASTER OF SCIENCE (N = 706)

VARIABLE	CORRELATION	SAMPLE SIZE	SIGNIFICANCE
UGPA	.112	580	.007
UPRCT	.146	188	.045
GMATT	.345	23	.107

GRADUATE DEGREE: MASTER OF ARTS (N = 309)

VARIABLE	CORRELATION	SAMPLE SIZE	SIGNIFICANCE
AGE	-.152	252	.016
PSVC	-.225	254	.001
GRET	-.209	62	.103

Prediction Models

The prediction models were calculated using stepwise regression. The same classifications used for the correlation matrices were used to develop the prediction models. The predictor variables in the prediction models may differ from the predictor variables in the correlation matrices because of missing data. In stepwise regression, only records with data for every variable can be included in the models. Because of missing data, primary and alternate prediction models were developed. The primary models maximize the sample size, and the alternate models maximize the validity coefficient (presented as "Multiple R" in the tables).

There are trade-offs with using the two models. The smaller sample models are less representative than the larger sample models, but they have much higher validity coefficients. Conversely, the larger sample models are more realistic because they represent larger numbers of records, but they have lower validity coefficients.

Some classifications have only one prediction model, and some classifications do not have any prediction models. Prediction models that did not meet a .15 level of significance or had sample sizes too small to render an accurate prediction were not included. The general prediction model for all categories of classification is presented in Table 11.

Table 11

Prediction Model for all Categories

Prediction Model	
PREDICTOR	WEIGHT
UGPA	+0.07373968
AGE	-0.01388346
OUT	+0.02408828
CONSTANT	+3.60127889
MULTIPLE R =	0.15289
SAMPLE SIZE =	950

As suggested by Baird (1975) and Van Scotter (1983), the individual branches and graduate disciplines were further classified into divisions and degrees awarded, respectively, to reduce small-sample instability in the individual branches and the graduate disciplines. The 15 branches were grouped into three divisions: combat arms, combat support, and combat service support (See Table 6). The five graduate disciplines were classified according to their corresponding degrees awarded: Master of Business Administration, Master of Science, and Master of Arts (See Table 6). Table 12 provides a prediction model unique to each of the divisions. Table 13 shows the prediction models for each graduate discipline. The officers in the sample are classified according to degrees awarded in Table 14. Primary and alternate model were developed for each category of classification. Alternate prediction models for each model presented in this chapter, as well as both the primary and alternate prediction models for the other categories of classification will be found in Appendix C.

Table 12

Prediction Models for Divisions

Division: Combat Arms
Prediction Model

PREDICTOR	WEIGHT
UGPA	+0.04729127
AGE	-0.01137062
COMP	+0.11471820
CONSTANT	+3.68126111
MULTIPLE R =	0.15369
SAMPLE SIZE =	446

Division: Combat Support
Prediction Model

PREDICTOR	WEIGHT
UGPA	+0.09847177
AFCS	+0.00238279
CONSTANT	+3.08380136
MULTIPLE R =	0.23179
SAMPLE SIZE =	331

Division: Combat Service Support
Prediction Model

PREDICTOR	WEIGHT
UGPA	+0.13409215
OUT	+0.02902875
PSVC	-0.00339041
CONSTANT	+2.91834300
MULTIPLE R =	0.28356
SAMPLE SIZE =	156

Table 13

Prediction Models for Graduate Disciplines

Graduate Discipline: Business
Prediction Model

PREDICTOR	WEIGHT
PSVC	-0.00284727
GENDER	-0.24768357
CONSTANT	+3.82455920
MULTIPLE R =	0.22586
SAMPLE SIZE =	217

Graduate Discipline: Engineering
Prediction Model

PREDICTOR	WEIGHT
UGPA	+0.17463566
CONSTANT	+2.97559196
MULTIPLE R =	0.24724
SAMPLE SIZE =	376

Graduate Discipline: Humanities
Prediction Model

PREDICTOR	WEIGHT
GENDER	+0.23293023
COMP	-0.22542326
CONSTANT	+3.64880000
MULTIPLE R =	0.36637
SAMPLE SIZE =	58

Graduate Discipline: Physical Sciences
Prediction Model

PREDICTOR	WEIGHT
OUT	-0.09062401
CONSTANT	+4.33189847
MULTIPLE R =	0.79407
SAMPLE SIZE =	20

Graduate Discipline: Social Sciences
Prediction Model

PREDICTOR	WEIGHT
PSVC	-0.00299663
CONSTANT	+3.73266656
MULTIPLE R =	0.18973
SAMPLE SIZE =	243

Table 14

Prediction Models for Graduate Degrees Awarded

Graduate Degree: Master of Business Administration

Prediction Model

PREDICTOR	WEIGHT
UGPA	+0.10795693
OUT	+0.03914791
PSVC	-0.00337747
COMP	+0.14952332
CONSTANT	+2.70063372
MULTIPLE R =	0.39515
SAMPLE SIZE =	98

Graduate Degree: Master of Science

Prediction Model

PREDICTOR	WEIGHT
UGPA	+0.06806463
CONSTANT	+3.36277250
MULTIPLE R =	0.11101
SAMPLE SIZE =	560

Graduate Degree: Master of Arts

Prediction Model

PREDICTOR	WEIGHT
PSVC	-0.00303249
CONSTANT	+3.70305760
MULTIPLE R =	0.22529
SAMPLE SIZE =	243

This study's primary prediction models have validity coefficients ranging from .09 to .79, with most of the models falling between .20 and .40. The alternate models have validity coefficients ranging from .28 to .68, with all but 3 of the 11 models falling between .30 and .50. These findings are very similar to the ranges estimated by Anastasi (1982), Womer (1968), and Traxler (1952) discussed in chapter one.

Classifying the sample revealed results similar to those found by Baird (1975) and Van Scotter (1983). Different branches and graduate disciplines have specific predictor variables in their models that were unique for those particular branches and disciplines. These variables were not in the prediction models for the divisions or the degrees awarded. In general, the specific variables appropriate to predicting success for the divisions and the degrees awarded were found to have complex patterns depending upon the branch and the graduate discipline. Some models contained variables in common with many others, while other models included variables not found in other individual branches and graduate disciplines.

IV. Discussion, Conclusions, and Recommendations

Introduction

This chapter discusses the study's findings in terms of general trends and findings unique to certain classification categories. The investigative questions are examined, and recommendations are made to improve the selection procedures for the Fully Funded Graduate Program.

Trends

Undergraduate grade point average (UGPA), GRE and GMAT scores, prior service (PSVC), age, years since undergraduate degree (OUT), and component (COMP) were found to be common in many of the models.

Table 7 identifies eight valid predictors of GGPA common to all classification categories. Note that these are only the broadly valid predictors of GGPA. There are also additional predictors unique to certain categories of classification. Tables 8, 9, 10, and Appendix B identify the eight variables plus seven other predictors valid according to the particular classification (Table 6). If a predictor variable is not in a model, this means that there was not sufficient evidence in the sample to support that variable as a valid predictor of GGPA.

Previous research predominantly focused on undergraduate grades and standardized test scores as the most popular predictors of success in graduate studies. This study found

no evidence to support the sole use of these variables across the categories of classification. While these variables have predictive validity which varies depending upon sample size and strength of the relationship, decision makers may also wish to consider the use of other valid predictors identified in this study.

UGPA was found to be valid for the largest number of classification categories. One out of every three models included UGPA as a predictor variable. In general, the officers with the higher undergraduate grades tended to achieve higher graduate grades. This finding must be analyzed in its proper perspective. UGPA means for the branches in Appendix A have a range between 2.85 to 3.23, inclusive, with over one-quarter of the officers having grade point averages below 2.85. Before making a decision about the applicant on the basis of grades, the decision maker should determine what effect grades had on success in that projected area of study. The prediction models will show the effect, if any.

Except for a few classifications, standardized test scores were not major contributors to the prediction models. In the case of GMAT scores, for example, this may be the result of the small number of scores available (N = 71).

The amount of prior service (PSVC) consistently exhibited a negative effect on GGPA. Officers with enlisted or warrant officer service tended not to be as successful as those without prior service. A possible explanation might have to

do with the manner in which prior service officers obtained their undergraduate degrees. In most cases, these officers entered the Army before completing an undergraduate degree, doing so on a part-time basis while on active duty, taking one or two courses at a time. When they enter graduate school, the academic environment may be much more intense, requiring four to six courses at a time. This adjustment to a full-time academic environment may therefore be a disadvantage to them since their counterparts with no prior service should be more familiar with such an environment.

Age was a frequent negative predictor variable. The older an officer at the start of graduate school, the lower his/her GGPA. This may partially be the result of having difficulty making the transition from a military environment to an academic environment. Another explanation may be the loss of unpracticed quantitative skills for certain graduate programs that were quantitatively oriented.

Another consistent finding was the effect the number of years since undergraduate school (OUT) had on GGPA. This predictor variable's positive relation with GGPA suggests that the officers who had been out of undergraduate school for the longer periods, up to a certain point, tended to have a higher degree of success in graduate school than those officers who had more recently completed their undergraduate degrees. A logical explanation for OUT's positive effect on GGPA might be the positive influence that job experience and increased maturity have on pursuing a graduate degree. This finding may

initially appear to contradict the previous discussion on AGE, but OUT and AGE rarely appeared in the same models.

Another variable consistently included in the prediction models was component (COMP). The results are mixed because of the missing data. The correlation matrices revealed a definite positive correlation between COMP and GGPA, indicating Regular Army (RA) officers tended to be more successful in graduate school than other than Regular Army officers (OTRA). This may be the result of the competitive process for an RA appointment. With the exception of USMA graduates who receive RA appointments upon graduation from the Military Academy, officers are selected for an RA appointment on the basis of certain qualifications. Those officers selected for RA appointment may have backgrounds more conducive to success in graduate school. The mixed positive and negative effect COMP has in the prediction models is the result of missing data. The decision maker must examine the proportion of the sample size in the model and the size of the Multiple R before deciding if the use of COMP will result in an accurate prediction.

Peculiarities

In addition to the common findings described above, the prediction models yielded a number of unique findings for particular classification categories. These findings are briefly summarized on the next page:

1. The primary prediction models for each of the three divisions included UGPA as a positive predictor variable;

2. Female officers had higher degrees of success in graduate humanities programs;

3. The longer an officer in the graduate physical sciences discipline was out of undergraduate school, the lower was his/her UGPA;

4. The prediction indicators for the Armor branch suggest that the younger, less experienced officers had a higher probability of success in graduate school;

5. The GRE Test is a valid predictor for officers attending the Naval Post-Graduate School and the Air Force Institute of Technology. This finding may be true for all classification categories, but could not be determined because of missing data;

6. Undergraduate class standing and standardized test scores, in general, had a negative effect on GGPA for Military Intelligence Corps officers, suggesting that these traditional measures of success may be misleading in predicting these officers' abilities in graduate school;

7. The correlation matrix for officers with undergraduate engineering disciplines revealed that the UPRCT had a negative effect on GGPA and that UGPA had a positive effect. These findings suggest that decision makers should consider the varying degrees of difficulty for undergraduate engineering programs. An officer with an UGPA of 3.20 in engineering from an engineering school like the Massachusetts

Institute of Technology may rank in the 45th percentile. In comparison, officer with the same UGPA in engineering from a predominantly business school may rank in the 65th percentile. Although the MIT graduate has a lower percentile, he will most likely have a higher degree of success in graduate school.

Conclusions

An appropriate conclusion for a study of this nature is to examine the investigative questions.

(1) What percentage of Army officers who started fully funded graduate programs during fiscal years 1982, 1983, and 1984 successfully completed them?

Only 22 of the 1201 officers in this study, or 1.83% failed to successfully complete fully funded graduate school. During the years included in this study, there was some leniency in allowing officers to switch from one program to another if the chances of failure seemed likely. This caused some AERB positions to go unfilled. To ensure a better utilization of graduate school positions, recent Army guidance has significantly limited program switching. As a result, future failure rates may be higher.

Current failure rates of other services were not available. Van Scotter (1983) found the percentage of Air Force officers who failed to graduate from the Air Force Institute of Technology (the Air Force's primary source of graduate degrees) during the years 1977 through 1982 was 7%. Van Scotter (1983) claimed, "This is a very respectable

figure, when compared to the graduate rates normally found in civilian graduate institutions" (p. 57). These low failure rates may also be due to the impact failure has on the career of an officer.

(2) What were the selection criteria?

(3) Did all of the officers meet the selection criteria?

The Army does not have standard selection criteria. The approval authorities review a number of the predictor variables examined in this study (UGPA, UPRCT, standardized test scores, AFCS, COMP) in addition to qualitative evaluations by the applicants' field grade commanders, military performance reports, and subjective evaluations on promotion potential. No established cut-off areas (e.g. minimum GPA or GRE scores) automatically eliminate an officer from consideration. This study was unable to determine if all of the officers met the selection criteria for the particular branch or graduate program because of the flexible, decentralized selection process at career branch level and subsequent review at higher levels (See application process in Chapter one). As evidenced by the low failure rate previously reported, this decentralized approach appears to yield respectable results. An analysis of the data for the 22 officers who failed was inconclusive since nearly half of their records were unavailable.

(4) What other likely predictors for success in an officer's record are not included in the Army's selection criteria?

(5) What are the best predictors for success in an officer's records?

(6) Are there predictors which are more accurate for specific programs?

This study examined all of the quantifiable predictor variables in an officer's record. Only two variables appeared not to be generally considered in the selection process. These variables are OUT and PSVC. The study found that one "best" model will not suffice for all programs. Combinations of variables predict success more accurately for certain programs.

Recommendations

The selection process for fully funded graduate education has two primary elements, military and academic performance. Career managers evaluate military performance by examining evaluation reports, chain-of-command input, and promotion potential. Career managers evaluate academic performance using undergraduate transcripts and standardized test scores.

Military and academic performance should continue to be examined separately. This study makes some suggestions for improving the measurement of academic performance, both in the short and the long term.

For the short term, this study recommends using graduate discipline as the primary classification category, and the prediction models in Table 13. Other models may have higher

validity coefficients, but getting the officers in the program that is best for them makes using the models in this classification appropriate.

For the long term, this research should be the springboard for future studies. This study was a general model for the entire Army based on graduate programs three, four, and five-years old at the time of printing. The types of graduate programs to which the Army currently sends officers has changed to keep pace with modernization requirements. As such, the results, while accurate, may not reflect the complete needs of today's more technical graduate programs. This study may not have covered particular areas in as much detail as some managers would have prefered, usually due to missing data. Decision makers should develop their own models based on the particular characteristics of their areas. For example, it may be valuable to develop decision models that examine how well officers did in undergraduate courses that parallel their respective graduate disciplines. Another possibility may be the use of a criteria other than GGPA, such as a criterion that measures success after graduate school, evaluation reports from follow-on utilization tours, promotion board results, or surveys of the graduates. Since a database for Army graduate programs in the Officer Personnel Management Directorate is now available, career managers should keep data on standardized test results, undergraduate grades, graduate grades, and the other potential predictor variables listed in Table 5. It is especially important to build a separate

database for officers who change programs or who do not complete a program. This would eliminate the manual search currently necessary to produce this data. Once an updated database is available, career managers should develop new models using the approach of this study.

Deciding which officers to send for advanced degrees becomes even more important with the increasing cost of education and the higher technology disciplines needed to modernize the force. Decision makers must record performance and validate selection procedures to ensure the selection of the most qualified officers.

Appendix A: Branch Profiles

Air Defense

PROFILE	SAMPLE SIZE	% OF OFFICERS
SOURCE OF COMMISSION:		
OFFICER CANDIDATE SCHOOL	1	2.00
RESERVE OFFICER TRAINING CORPS	18	36.00
UNITED STATES MILITARY ACADEMY	30	60.00
OTHER	1	2.00
MISSING	2	
COMPONENT:		
REGULAR ARMY	41	82.00
OTHER THAN REGULAR ARMY	9	18.00
MISSING	2	
GRADUATE PROGRAM:		
BUSINESS	8	15.38
ENGINEERING	25	48.08
HUMANITIES	3	5.77
PHYSICAL SCIENCES	6	11.54
SOCIAL SCIENCES	10	19.23
MISSING	0	

VARIABLE MEANS

VARIABLE	SAMPLE SIZE	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
AFCS (mons)	49	88.49	23.62	60.00	167.00
UGPA (4.00)	45	3.18	.41	2.21	4.00
GRET	21	1226.67	142.88	860.00	1410.00
GMATT	0				
GGPA (4.00)	49	3.48	.35	1.75	4.00

Adjutant General's Corps

PROFILE	SAMPLE SIZE	% OF OFFICERS
SOURCE OF COMMISSION:		
OFFICER CANDIDATE SCHOOL	9	12.00
RESERVE OFFICER TRAINING CORPS	47	62.67
UNITED STATES MILITARY ACADEMY	10	13.33
OTHER	9	12.00
MISSING	0	
COMPONENT:		
REGULAR ARMY	50	66.67
OTHER THAN REGULAR ARMY	25	33.33
MISSING	0	
GRADUATE PROGRAM:		
BUSINESS	37	49.33
ENGINEERING	11	14.67
HUMANITIES	15	20.00
PHYSICAL SCIENCES	1	1.33
SOCIAL SCIENCES	11	14.67
MISSING	0	

VARIABLE MEANS

VARIABLE	SAMPLE SIZE	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
AFCS (mons)	74	92 [illegible]	29.56	3.00	169.00
UGPA (4.00)	64	2.90	.44	2.06	4.00
GRET	13	1068.46	162.83	810.00	1410.00
GMATT	10	500.50	86.51	370.00	650.00
GGPA (4.00)	63	3.53	.50	2.00	4.00

Armor

PROFILE	SAMPLE SIZE	% OF OFFICERS
SOURCE OF COMMISSION:		
OFFICER CANDIDATE SCHOOL	2	2.15
RESERVE OFFICER TRAINING CORPS	33	35.48
UNITED STATES MILITARY ACADEMY	58	62.37
OTHER	0	0.00
MISSING	0	
COMPONENT:		
REGULAR ARMY	85	91.40
OTHER THAN REGULAR ARMY	8	8.60
MISSING	0	
GRADUATE PROGRAM:		
BUSINESS	14	15.05
ENGINEERING	21	22.58
HUMANITIES	13	13.98
PHYSICAL SCIENCES	4	4.30
SOCIAL SCIENCES	41	44.09
MISSING	0	

VARIABLE MEANS

VARIABLE	SAMPLE SIZE	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
AFCS (mons)	93	88.40	21.03	4.00	159.00
UGPA (4.00)	87	3.08	.42	2.10	3.98
GRET	31	1193.25	182.20	690.00	1530.00
GMATT	2	610.00	14.14	600.00	620.00
GGPA (4.00)	86	3.60	.31	2.25	4.00

Aviation

PROFILE	SAMPLE SIZE	% OF OFFICERS
SOURCE OF COMMISSION:		
OFFICER CANDIDATE SCHOOL	6	9.23
RESERVE OFFICER TRAINING CORPS	21	32.31
UNITED STATES MILITARY ACADEMY	37	56.92
OTHER	1	1.54
MISSING	1	
COMPONENT:		
REGULAR ARMY	61	93.85
OTHER THAN REGULAR ARMY	4	6.15
MISSING	1	
GRADUATE PROGRAM:		
BUSINESS	12	18.18
ENGINEERING	40	60.61
HUMANITIES	3	4.55
PHYSICAL SCIENCES	1	1.52
SOCIAL SCIENCES	10	15.15
MISSING	0	

VARIABLE MEANS

VARIABLE	SAMPLE SIZE	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
AFCS (mons)	65	111.86	35.03	1.00	212.00
UGPA (4.00)	51	3.01	.46	2.10	3.93
GRET	20	1206.00	140.76	960.00	1450.00
GMATT	5	506.20	36.09	451.00	5[illegible]0.00
GGPA (4.00)	49	3.48	.37	2.25	4.00

Chemical Corps

PROFILE	SAMPLE SIZE	% OF OFFICERS
SOURCE OF COMMISSION:		
OFFICER CANDIDATE SCHOOL	6	22.22
RESERVE OFFICER TRAINING CORPS	13	48.15
UNITED STATES MILITARY ACADEMY	5	18.52
OTHER	3	11.11
MISSING	0	
COMPONENT:		
REGULAR ARMY	15	55.56
OTHER THAN REGULAR ARMY	12	44.44
MISSING	0	
GRADUATE PROGRAM:		
BUSINESS	0	0.00
ENGINEERING	16	61.54
HUMANITIES	0	0.00
PHYSICAL SCIENCES	10	38.46
SOCIAL SCIENCES	0	0.00
MISSING	1	

VARIABLE MEANS

VARIABLE	SAMPLE SIZE	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
AFCS (mons)	27	71.96	31.30	4.00	148.00
UGPA (4.00)	25	3.13	.44	2.02	3.91
GRET	13	1173.85	159.98	930.00	1440.00
GMATT	1	581.00			
GGPA (4.00)	26	3.51	.29	3.02	4.00

Corps of Engineers

PROFILE	SAMPLE SIZE	% OF OFFICERS
SOURCE OF COMMISSION:		
OFFICER CANDIDATE SCHOOL	8	3.92
RESERVE OFFICER TRAINING CORPS	76	37.25
UNITED STATES MILITARY ACADEMY	115	56.37
OTHER	5	2.45
MISSING	0	
COMPONENT:		
REGULAR ARMY	167	81.86
OTHER THAN REGULAR ARMY	37	18.14
MISSING	0	
GRADUATE PROGRAM:		
BUSINESS	9	4.41
ENGINEERING	168	82.35
HUMANITIES	3	1.47
PHYSICAL SCIENCES	15	7.35
SOCIAL SCIENCES	9	4.41
MISSING	0	

VARIABLE MEANS

VARIABLE	SAMPLE SIZE	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
AFCS (mons)	204	85.17	24.35	2.00	156.00
UGPA (4.00)	163	3.23	.50	2.08	3.95
GRET	74	1207.97	137.19	870.00	1430.00
GMATT	2	618.00	158.39	506.00	730.00
GGPA (4.00)	155	3.62	.27	2.50	4.00

Field Artillery

PROFILE	SAMPLE SIZE	% OF OFFICERS
SOURCE OF COMMISSION:		
OFFICER CANDIDATE SCHOOL	8	6.40
RESERVE OFFICER TRAINING CORPS	29	23.20
UNITED STATES MILITARY ACADEMY	88	70.40
OTHER	0	0.00
MISSING	0	
COMPONENT:		
REGULAR ARMY	112	89.60
OTHER THAN REGULAR ARMY	13	10.40
MISSING	0	
GRADUATE PROGRAM:		
BUSINESS	23	18.55
ENGINEERING	41	33.06
HUMANITIES	11	8.87
PHYSICAL SCIENCES	11	8.87
SOCIAL SCIENCES	38	30.65
MISSING	1	

VARIABLE MEANS

VARIABLE	SAMPLE SIZE	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
AFCS (mons)	125	93.67	29.69	4.00	276.00
UGPA (4.00)	109	3.07	.43	1.95	3.95
GRET	24	1230.00	141.05	990.00	1570.00
GMATT	8	576.50	85.09	490.00	740.00
GGPA (4.00)	109	3.59	.30	2.50	4.00

Finance Corps

PROFILE	SAMPLE SIZE	% OF OFFICERS
SOURCE OF COMMISSION:		
OFFICER CANDIDATE SCHOOL	2	4.76
RESERVE OFFICER TRAINING CORPS	35	83.33
UNITED STATES MILITARY ACADEMY	3	7.14
OTHER	2	4.76
MISSING	0	
COMPONENT:		
REGULAR ARMY	18	42.86
OTHER THAN REGULAR ARMY	24	57.14
MISSING	0	
GRADUATE PROGRAM:		
BUSINESS	35	83.33
ENGINEERING	3	7.14
HUMANITIES	1	2.38
PHYSICAL SCIENCES	0	0.00
SOCIAL SCIENCES	3	7.14
MISSING	0	

VARIABLE MEANS

VARIABLE	SAMPLE SIZE	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
AFCS (mons)	42	96.48	23.80	53.00	154.00
UGPA (4.00)	37	2.98	.49	2.27	3.98
GRET	3	1033.33	231.80	820.00	1280.00
GMATT	23	532.57	82.43	345.00	680.00
GGPA (4.00)	35	3.47	.36	2.50	4.00

Infantry

PROFILE	SAMPLE SIZE	% OF OFFICERS
SOURCE OF COMMISSION:		
OFFICER CANDIDATE SCHOOL	10	4.81
RESERVE OFFICER TRAINING CORPS	61	29.33
UNITED STATES MILITARY ACADEMY	135	64.90
OTHER	2	.96
MISSING	6	
COMPONENT:		
REGULAR ARMY	197	94.71
OTHER THAN REGULAR ARMY	11	5.29
MISSING	6	
GRADUATE PROGRAM:		
BUSINESS	40	18.69
ENGINEERING	43	20.09
HUMANITIES	14	6.54
PHYSICAL SCIENCES	11	5.14
SOCIAL SCIENCES	106	49.53
MISSING	0	

VARIABLE MEANS

VARIABLE	SAMPLE SIZE	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
AFCS (mons)	208	94.15	21.22	49.00	169.00
UGPA (4.00)	181	2.95	.49	1.76	4.00
GRET	49	1176.12	158.52	780.00	1550.00
GMATT	5	543.20	75.81	472.00	644.00
GGPA (4.00)	181	3.62	.28	2.75	4.00

Military Intelligence Corps

PROFILE	SAMPLE SIZE	% OF OFFICERS
SOURCE OF COMMISSION:		
OFFICER CANDIDATE SCHOOL	5	7.69
RESERVE OFFICER TRAINING CORPS	41	63.08
UNITED STATES MILITARY ACADEMY	17	26.15
OTHER	2	3.08
MISSING	0	
COMPONENT:		
REGULAR ARMY	52	80.00
OTHER THAN REGULAR ARMY	13	20.00
MISSING	0	
GRADUATE PROGRAM:		
BUSINESS	14	21.54
ENGINEERING	13	20.00
HUMANITIES	6	9.23
PHYSICAL SCIENCES	3	4.62
SOCIAL SCIENCES	29	44.62
MISSING	0	

VARIABLE MEANS

VARIABLE	SAMPLE SIZE	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
AFCS (mons)	65	103.42	33.62	3.00	192.00
UGPA (4.00)	54	3.03	.43	2.00	3.92
GRET	25	1180.40	142.38	860.00	1390.00
GMATT	5	519.60	84.03	380.00	589.00
GGPA (4.00)	54	3.65	.24	2.63	4.00

Military Police Corps

PROFILE	SAMPLE SIZE	% OF OFFICERS
SOURCE OF COMMISSION:		
OFFICER CANDIDATE SCHOOL	4	15.38
RESERVE OFFICER TRAINING CORPS	17	65.38
UNITED STATES MILITARY ACADEMY	0	0.00
OTHER	5	19.23
MISSING	0	
COMPONENT:		
REGULAR ARMY	17	65.38
OTHER THAN REGULAR ARMY	9	34.62
MISSING	0	
GRADUATE PROGRAM:		
BUSINESS	6	23.08
ENGINEERING	3	11.54
HUMANITIES	4	15.38
PHYSICAL SCIENCES	0	0.00
SOCIAL SCIENCES	13	50.00
MISSING	0	

VARIABLE MEANS

VARIABLE	SAMPLE SIZE	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
AFCS (mons)	26	99.31	23.45	52.00	149.00
UGPA (4.00)	20	2.96	.51	2.00	3.80
GRET	7	950.00	186.10	630.00	1170.00
GMATT	2	485.00	77.78	430.00	540.00
GGPA (4.00)	20	3.79	.23	3.09	4.00

Ordnance Corps

PROFILE	SAMPLE SIZE	% OF OFFICERS
SOURCE OF COMMISSION:		
OFFICER CANDIDATE SCHOOL	5	13.51
RESERVE OFFICER TRAINING CORPS	22	59.46
UNITED STATES MILITARY ACADEMY	10	27.03
OTHER	0	0.00
MISSING	1	
COMPONENT:		
REGULAR ARMY	26	70.27
OTHER THAN REGULAR ARMY	11	29.73
MISSING	1	
GRADUATE PROGRAM:		
BUSINESS	19	50.00
ENGINEERING	14	36.84
HUMANITIES	0	0.00
PHYSICAL SCIENCES	3	7.89
SOCIAL SCIENCES	2	5.26
MISSING	0	

VARIABLE MEANS

VARIABLE	SAMPLE SIZE	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
AFCS (mons)	37	87.35	23.48	52.00	132.00
UGPA (4.00)	31	2.98	.46	2.06	3.67
GRET	7	1208.57	205.87	960.00	1490.00
GMATT	5	503.60	76.25	410.00	618.00
GGPA (4.00)	32	3.40	.33	2.88	4.00

Quartermaster Corps

PROFILE	SAMPLE SIZE	% OF OFFICERS
SOURCE OF COMMISSION:		
OFFICER CANDIDATE SCHOOL	3	14.29
RESERVE OFFICER TRAINING CORPS	14	66.67
UNITED STATES MILITARY ACADEMY	1	4.76
OTHER	3	14.29
MISSING	0	
COMPONENT:		
REGULAR ARMY	12	57.14
OTHER THAN REGULAR ARMY	9	42.86
MISSING	0	
GRADUATE PROGRAM:		
BUSINESS	8	38.10
ENGINEERING	5	23.81
HUMANITIES	0	0.00
PHYSICAL SCIENCES	2	9.52
SOCIAL SCIENCES	6	28.57
MISSING	0	

VARIABLE MEANS

VARIABLE	SAMPLE SIZE	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
AFCS (mons)	21	109.38	22.35	75.00	145.00
UGPA (4.00)	19	2.85	.40	2.20	3.46
GRET	5	1210.00	96.18	1130.00	1350.00
GMATT	1	540.00			
GGPA (4.00)	19	3.64	.26	3.12	3.98

Signal Corps

PROFILE	SAMPLE SIZE	% OF OFFICERS
SOURCE OF COMMISSION:		
OFFICER CANDIDATE SCHOOL	6	5.66
RESERVE OFFICER TRAINING CORPS	44	41.51
UNITED STATES MILITARY ACADEMY	54	50.94
OTHER	2	1.89
MISSING	1	
COMPONENT:		
REGULAR ARMY	88	83.02
OTHER THAN REGULAR ARMY	18	16.98
MISSING	1	
GRADUATE PROGRAM:		
BUSINESS	18	16.82
ENGINEERING	67	62.62
HUMANITIES	4	3.74
PHYSICAL SCIENCES	0	0.00
SOCIAL SCIENCES	18	16.82
MISSING	0	

VARIABLE MEANS

VARIABLE	SAMPLE SIZE	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
AFCS (mons)	104	82.31	19.17	3.00	123.00
UGPA (4.00)	93	3.05	.37	1.92	3.84
GRET	29	1217.24	111.70	970.00	1380.00
GMATT	0				
GGPA (4.00)	96	3.51	.29	2.45	3.92

Transportation Corps

PROFILE	SAMPLE SIZE	% OF OFFICERS
SOURCE OF COMMISSION:		
OFFICER CANDIDATE SCHOOL	0	0.00
RESERVE OFFICER TRAINING CORPS	13	86.67
UNITED STATES MILITARY ACADEMY	1	6.67
OTHER	1	6.67
MISSING	0	
COMPONENT:		
REGULAR ARMY	13	86.67
OTHER THAN REGULAR ARMY	2	13.33
MISSING	0	
GRADUATE PROGRAM:		
BUSINESS	8	53.33
ENGINEERING	0	0.00
HUMANITIES	3	20.00
PHYSICAL SCIENCES	4	26.67
SOCIAL SCIENCES	0	0.00
MISSING	0	

VARIABLE MEANS

VARIABLE	SAMPLE SIZE	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
AFCS (mons)	15	97.47	34.68	40.00	164.00
UGPA (4.00)	12	3.09	.49	2.30	3.79
GRET	2	1230.00	113.14	1150.00	1310.00
GMATT	3	533.33	41.63	500.00	580.00
GGPA (4.00)	12	3.57	.17	3.28	3.83

Appendix B: Correlation Matrices for Branch, Component, Source of Commission, Undergraduate Discipline, and Graduate Discipline

BRANCH: AIR DEFENSE ARTILLERY (N = 52)

VARIABLE	CORRELATION	SAMPLE SIZE	SIGNIFICANCE
COMP	-.238	49	.100
UPRCT	.435	18	.072

BRANCH: ADJUTANT GENERAL'S CORPS (N = 75)

VARIABLE	CORRELATION	SAMPLE SIZE	SIGNIFICANCE
GMATV	.680	10	.031
GMATT	.593	10	.071
OUT	.220	62	.086

BRANCH: ARMOR (N = 93)

VARIABLE	CORRELATION	SAMPLE SIZE	SIGNIFICANCE
AGE	-.223	86	.039
AFCS	-.215	86	.047
COMP	.235	86	.030
OUT	-.305	85	.005

BRANCH: AVIATION (N = 66)

VARIABLE	CORRELATION	SAMPLE SIZE	SIGNIFICANCE
COMP	-.254	49	.078

BRANCH: CHEMICAL CORPS (N = 27)

VARIABLE	CORRELATION	SAMPLE SIZE	SIGNIFICANCE
AFCS	.388	26	.050

BRANCH: CORPS OF ENGINEERS (N = 204)

VARIABLE	CORRELATION	SAMPLE SIZE	SIGNIFICANCE
AFCS	.199	155	.013
UGPA	.169	152	.037

BRANCH: FIELD ARTILLERY (N = 125)

NO CORRELATIONS SIGNIFICANT AT .10

BRANCH: FINANCE CORPS (N = 42)

VARIABLE	CORRELATION	SAMPLE SIZE	SIGNIFICANCE
GENDER	-.322	35	.059
PSVC	-.275	35	.110
GMATQ	.370	20	.108

BRANCH: INFANTRY (N = 214)

VARIABLE	CORRELATION	SAMPLE SIZE	SIGNIFICANCE
COMP	.168	181	.024
UGPA	.157	175	.038
GREV	.404	47	.005

BRANCH: MILITARY INTELLIGENCE CORPS (N = 65)

VARIABLE	CORRELATION	SAMPLE SIZE	SIGNIFICANCE
UPRCT	-.509	13	.076

BRANCH: MILITARY POLICE CORPS (N = 26)

NO CORRELATIONS SIGNIFICANT AT .10

BRANCH: ORDNANCE CORPS (N = 38)

VARIABLE	CORRELATION	SAMPLE SIZE	SIGNIFICANCE
PSVC	-.373	32	.036
GREQ	.841	7	.018
GREA	.828	5	.083

BRANCH: QUARTERMASTER CORPS (N = 21)

NO CORRELATIONS SIGNIFICANT AT .10

BRANCH: SIGNAL CORPS (N = 107)

VARIABLE	CORRELATION	SAMPLE SIZE	SIGNIFICANCE
GENDER	-.219	96	.032

BRANCH: TRANSPORTATION CORPS (N = 15)

NO CORRELATIONS SIGNIFICANT AT .10

COMPONENT: REGULAR ARMY (N = 980)

VARIABLE	CORRELATION	SAMPLE SIZE	SIGNIFICANCE
UGPA	.089	804	.012
UPRCT	.135	251	.033
GMATQ	.349	45	.019

COMPONENT: OTHER THAN REGULAR ARMY (N = 210)

VARIABLE	CORRELATION	SAMPLE SIZE	SIGNIFICANCE
AFCS	.206	173	.007
UGPA	.127	167	.101
OUT	.224	168	.004

SOURCE OF COMMISSION: OCS (N = 81)

VARIABLE	CORRELATION	SAMPLE SIZE	SIGNIFICANCE
PSVC	-.230	62	.072
GREQ	.465	15	.081
GMATV	.762	6	.078
GMATQ	.927	6	.007
GMATT	.845	6	.034
OUT	.345	59	.007

SOURCE OF COMMISSION: ROTC (N = 500)

VARIABLE	CORRELATION	SAMPLE SIZE	SIGNIFICANCE
AFCS	.085	414	.085
COMP	-.100	416	.042
UGPA	.131	404	.008
GMATQ	.282	53	.041
OUT	.083	403	.098

SOURCE OF COMMISSION: USMA (N = 573)

VARIABLE	CORRELATION	SAMPLE SIZE	SIGNIFICANCE
UGPA	.090	481	.048
UPRCT	.165	193	.022

SOURCE OF COMMISSION: OTHER (N = 38)

VARIABLE	CORRELATION	SAMPLE SIZE	SIGNIFICANCE
UGPA	.329	28	.088

UNDERGRADUATE DISCIPLINE: BUSINESS (N = 123)

VARIABLE	CORRELATION	SAMPLE SIZE	SIGNIFICANCE
GENDER	-.162	119	.079
PSVC	-.238	113	.009
GMATQ	.321	36	.056

UNDERGRADUATE DISCIPLINE: ENGINEERING (N = 100)

VARIABLE	CORRELATION	SAMPLE SIZE	SIGNIFICANCE
GENDER	-.267	98	.008
COMP	-.173	98	.089
UGPA	.256	94	.013
UPRCT	-.378	21	.091
GREA	.367	31	.042

UNDERGRADUATE DISCIPLINE: HUMANITIES (N = 42)

VARIABLE	CORRELATION	SAMPLE SIZE	SIGNIFICANCE
COMP	-.278	39	.087
UGPA	.396	37	.015

UNDERGRADUATE DISCIPLINE: PHYSICAL SCIENCES (N = 86)

VARIABLE	CORRELATION	SAMPLE SIZE	SIGNIFICANCE
AGE	.186	84	.090
AFCS	.222	84	.043
OUT	.250	83	.023

UNDERGRADUATE DISCIPLINE: SOCIAL SCIENCES (N = 167)

VARIABLE	CORRELATION	SAMPLE SIZE	SIGNIFICANCE
PSVC	-.163	162	.039

UNDERGRADUATE DISCIPLINE: USMA (N = 573)

CORRELATION MATRICES FOR UNDERGRADUATE DISCIPLINE: USMA AND SOURCE OF COMMISSION: USMA ARE THE SAME.

GRADUATE SCHOOL: FEDERAL (N = 303)

VARIABLE	CORRELATION	SAMPLE SIZE	SIGNIFICANCE
UGPA	.171	258	.006
UPRCT	.334	93	.001
GREV	.250	97	.013
GREA	.390	54	.004
GRET	.233	96	.023
GMATQ	-.654	11	.029
GMATT	-.538	11	.088
OUT	.135	256	.030

GRADUATE SCHOOL: STATE (N = 199)

VARIABLE	CORRELATION	SAMPLE SIZE	SIGNIFICANCE
AGE	-.169	163	.031
PSVC	-.152	164	.052
GREV	.214	64	.090
GREA	.392	37	.016
OUT	-.130	165	.037

GRADUATE SCHOOL: SELECT (N = 179)

VARIABLE	CORRELATION	SAMPLE SIZE	SIGNIFICANCE
COMP	-.180	140	.030
UGPA	.284	137	.001

GRADUATE SCHOOL: SYRACUSE (N = 52)

VARIABLE	CORRELATION	SAMPLE SIZE	SIGNIFICANCE
UGPA	.412	42	.007
UPRCT	.522	15	.046

GRADUATE SCHOOL: OTHER (N = 468)

VARIABLE	CORRELATION	SAMPLE SIZE	SIGNIFICANCE
AFCS	.085	386	.095
COMP	-.135	390	.008
UGPA	.110	375	.034
GREA	-.286	64	.022
GMATQ	.510	26	.008
GMATT	.356	29	.058

Appendix C: Primary and Alternate Prediction Models

Prediction Model for all Categories (ALTERNATE)

Prediction Model

PREDICTOR	WEIGHT
GMATQ	+0.00444511
OUT	+0.04558695
AFCS	-0.00278749
CONSTANT	+3.15871558
MULTIPLE R =	0.41854
SAMPLE SIZE =	68

Branch: Air Defense Artillery (PRIMARY)

Prediction Model

PREDICTOR	WEIGHT
OUT	-0.03767250
CONSTANT	+3.80590250
MULTIPLE R =	0.31748
SAMPLE SIZE =	42

Branch: Air Defense Artillery (ALTERNATE)

Prediction Model

PREDICTOR	WEIGHT
UGPA	+0.24383247
AFCS	-0.00381987
CONSTANT	+3.02762751
MULTIPLE R =	0.51200
SAMPLE SIZE =	19

Branch: Adjutant General's Corps (PRIMARY)

Prediction Model

PREDICTOR	WEIGHT
OUT	+0.09103401
AFCS	-0.00550976
CONSTANT	+3.36111870
MULTIPLE R =	0.30381
SAMPLE SIZE =	60

Branch: Armor (PRIMARY)

Prediction Model

PREDICTOR	WEIGHT
OUT	-0.06269289
COMP	+0.30132218
CONSTANT	+3.73633447
MULTIPLE R =	0.40329
SAMPLE SIZE =	83

Branch: Armor (ALTERNATE)
Prediction Model

PREDICTOR	WEIGHT
GREQ	-0.00079394
COMP	+0.35660029
CONSTANT	+3.71766761
MULTIPLE R =	0.49640
SAMPLE SIZE =	31

Branch: Aviation (NO PREDICTION MODEL)

Branch: Chemical Corps (PRIMARY)
Prediction Model

PREDICTOR	WEIGHT
UGPA	+0.39848907
AFCS	+0.00628164
GENDER	+0.24425911
CONSTANT	+1.50346670
MULTIPLE R =	0.69632
SAMPLE SIZE =	23

Branch: Corps of Engineers (PRIMARY)
Prediction Model

PREDICTOR	WEIGHT
UGPA	+0.09070511
AGE	-0.02057428
AFCS	+0.00414406
CONSTANT	+3.59941120
MULTIPLE R =	0.30040
SAMPLE SIZE =	150

Branch: Field Artillery (PRIMARY)
Prediction Model

PREDICTOR	WEIGHT
COMP	+0.17719565
CONSTANT	+3.41160870
MULTIPLE R =	0.18598
SAMPLE SIZE =	102

Branch: Finance Corps (PRIMARY)
Prediction Model

PREDICTOR	WEIGHT
PSVC	-0.00401280
GENDER	-0.45085162
CONSTANT	+3.97390159
MULTIPLE R =	0.40436
SAMPLE SIZE =	35

Branch: Finance Corps (ALTERNATE)
Prediction Model

PREDICTOR	WEIGHT
GMATT	+0.00143761
CONSTANT	+2.76415323
MULTIPLE R =	0.37764
SAMPLE SIZE =	20

Branch: Infantry (PRIMARY)
Prediction Model

PREDICTOR	WEIGHT
UGPA	+0.08460344
AGE	-0.02958044
OUT	+0.04537756
CONSTANT	+3.93029640
MULTIPLE R =	0.24268
SAMPLE SIZE =	173

Branch: Infantry (ALTERNATE)
Prediction Model

PREDICTOR	WEIGHT
GREV	+0.00098785
CONSTANT	+3.04643217
MULTIPLE R =	0.35953
SAMPLE SIZE =	46

Branch: Military Intelligence Corps (PRIMARY)
Prediction Model

PREDICTOR	WEIGHT
GREQ	-0.00089851
CONSTANT	+4.13284219
MULTIPLE R =	0.30640
SAMPLE SIZE =	24

Branch: Military Police Corps (NO PREDICTION MODEL)

Branch: Ordnance Corps (PRIMARY)
Prediction Model

PREDICTOR	WEIGHT
UGPA	+0.22435992
PSVC	-0.00847628
AFCS	+0.00547657
CONSTANT	+2.32100794
MULTIPLE R =	0.55602
SAMPLE SIZE =	31

Branch: Quartermaster Corps (SAMPLE TOO SMALL)

Branch: Signal Corps (NO PREDICTION MODEL)

Branch: Transportation Corps (NO PREDICTION MODEL)

Division: Combat Arms (ALTERNATE)
Prediction Model

PREDICTOR	WEIGHT
GREV	+0.00059369
GREQ	-0.00049576
AFCS	-0.00202940
COMP	+0.24455872
CONSTANT	+3.29209193
MULTIPLE R =	0.32941
SAMPLE SIZE =	137

Division: Combat Service Support (ALTERNATE)
Prediction Model

PREDICTOR	WEIGHT
GMATT	+0.00098025
OUT	+0.07131302
AFCS	-0.00382182
CONSTANT	+2.85851769
MULTIPLE R =	0.51059
SAMPLE SIZE =	38

Source of Commission: OCS (PRIMARY)
Prediction Model

PREDICTOR	WEIGHT
OUT	+0.02585612
CONSTANT	+3.31763498
MULTIPLE R =	0.34313
SAMPLE SIZE =	57

Source of Commission: OCS (ALTERNATE)
Prediction Model

PREDICTOR	WEIGHT
AGE	-0.12033755
AFCS	+0.00418960
CONSTANT	+7.35258876
MULTIPLE R =	0.67510
SAMPLE SIZE =	15

Source of Commission: ROTC (PRIMARY)
Prediction Model

PREDICTOR	WEIGHT
UGPA	+0.10264147
AFCS	+0.00123666
CONSTANT	+3.19782640
MULTIPLE R =	0.16759
SAMPLE SIZE =	394

Source of Commission: ROTC (ALTERNATE)
Prediction Model

PREDICTOR	WEIGHT
GMATQ	+0.01101440
CONSTANT	+3.30045400
MULTIPLE R =	0.28160
SAMPLE SIZE =	53

Source of Commission: USMA (PRIMARY)
Prediction Model

PREDICTOR	WEIGHT
UGPA	+0.05674115
CONSTANT	+3.39232124
MULTIPLE R =	0.08748
SAMPLE SIZE =	471

Source of Commission: USMA (ALTERNATE)
Prediction Model

PREDICTOR	WEIGHT
AGE	-0.04263230
PSVC	+0.01042432
CONSTANT	+4.76979907
MULTIPLE R =	0.37610
SAMPLE SIZE =	56

Source of Commission: Other (PRIMARY)
Prediction Model

PREDICTOR	WEIGHT
UGPA	+0.31186573
CONSTANT	+2.52261823
MULTIPLE R =	0.32864
SAMPLE SIZE =	28

Undergraduate Discipline: Business (PRIMARY)
Prediction Model

PREDICTOR	WEIGHT
PSVC	-0.00334920
GENDER	-0.27661235
CONSTANT	+3.89001830
MULTIPLE R =	0.28998
SAMPLE SIZE =	118

Undergraduate Discipline: Business (ALTERNATE)
Prediction Model

PREDICTOR	WEIGHT
GMATQ	+0.01496412
CONSTANT	+3.16001305
MULTIPLE R =	0.32141
SAMPLE SIZE =	36

Undergraduate Discipline: Engineering (PRIMARY)
Prediction Model

PREDICTOR	WEIGHT
UGPA	+0.15443016
CONSTANT	+3.16676857
MULTIPLE R =	0.27639
SAMPLE SIZE =	87

Undergraduate Discipline: Humanities (PRIMARY)
Prediction Model

PREDICTOR	WEIGHT
UGPA	+0.30712390
AFCS	+0.00260269
COMP	-0.22790003
CONSTANT	+2.76072158
MULTIPLE R =	0.57539
SAMPLE SIZE =	37

Undergraduate Discipline: Physical Sciences (PRIMARY)
Prediction Model

PREDICTOR	WEIGHT
UGPA	+0.16016354
OUT	+0.03825494
CONSTANT	+2.71746201
MULTIPLE R =	0.31092
SAMPLE SIZE =	80

Undergraduate Discipline: Physical Sciences (ALTERNATE)

Prediction Model

PREDICTOR	WEIGHT
GENDER	+0.49285714
COMP	-0.28714286
CONSTANT	+3.38857143
MULTIPLE R =	0.41513
SAMPLE SIZE =	29

Undergraduate Discipline: Social Sciences (PRIMARY)

Prediction Model

PREDICTOR	WEIGHT
PSVC	-0.00211202
GENDER	-0.12308225
CONSTANT	+3.81220799
MULTIPLE R =	0.19434
SAMPLE SIZE =	156

Undegraduate Discipline: Social Sciences (ALTERNATE)

Prediction Model

PREDICTOR	WEIGHT
UGPA	+0.05493930
CONSTANT	+3.39652972
MULTIPLE R =	0.08432
SAMPLE SIZE =	469

Undergraduate Discipline: USMA (SEE SOURCE OF COMMISSION: USMA)

Graduate School: Federal (PRIMARY)
Prediction Model

PREDICTOR	WEIGHT
OUT	+0.01588406
CONSTANT	+3.42105479
MULTIPLE R =	0.13540
SAMPLE SIZE =	256

Graduate School: Federal (ALTERNATE)
Prediction Model

PREDICTOR	WEIGHT
GREV	+0.00068149
CONSTANT	+3.15829543
MULTIPLE R =	0.24961
SAMPLE SIZE =	96

Graduate School: State (PRIMARY)
Prediction Model

PREDICTOR	WEIGHT
AGE	-0.02495336
CONSTANT	+4.41198157
MULTIPLE R =	0.17591
SAMPLE SIZE =	162

Graduate School: State (ALTERNATE)
Prediction Model

PREDICTOR	WEIGHT
GREV	+0.00069841
AFCS	-0.00249524
CONSTANT	+3.52116843
MULTIPLE R =	0.34196
SAMPLE SIZE =	61

Graduate School: Select (PRIMARY)
Prediction Model

PREDICTOR	WEIGHT
AGE	-0.07581284
OUT	+0.05512995
PSVC	+0.01157233
GENDER	-0.39496028
CONSTANT	+5.73237177
MULTIPLE R =	0.30099
SAMPLE SIZE =	137

Graduate School: Select (ALTERNATE)
Prediction Model

PREDICTOR	WEIGHT
UGPA	+0.27907520
GRET	-0.00066334
CONSTANT	+3.42352151
MULTIPLE R =	0.40501
SAMPLE SIZE =	46

Graduate School: Syracuse (PRIMARY)
Prediction Model

PREDICTOR	WEIGHT
COMP	+0.13057576
CONSTANT	+3.47184848
MULTIPLE R =	0.27330
SAMPLE SIZE =	43

Graduate School: Syracuse (ALTERNATE)
Prediction Model

PREDICTOR	WEIGHT
UGPA	+0.17412092
COMP	+0.16387278
CONSTANT	+2.97510452
MULTIPLE R =	0.51737
SAMPLE SIZE =	24

Graduate School: Other (PRIMARY)
Prediction Model

PREDICTOR	WEIGHT
OUT	+0.01401444
COMP	-0.09431708
CONSTANT	+3.61186242
MULTIPLE R =	0.15176
SAMPLE SIZE =	374

Graduate School: Other (ALTERNATE)
Prediction Model

PREDICTOR	WEIGHT
GRET	-0.00028149
CONSTANT	+3.95431510
MULTIPLE R =	0.17498
SAMPLE SIZE =	104

Graduate Discipline: Business (ALTERNATE)
Prediction Model

PREDICTOR	WEIGHT
GMATQ	+0.01046316
OUT	+0.02565555
CONSTANT	+3.08819220
MULTIPLE R =	0.39173
SAMPLE SIZE =	59

Graduate Discipline: Engineering (ALTERNATE)
Prediction Model

PREDICTOR	WEIGHT
UPRCT	+0.00449426
CONSTANT	+3.19869550
MULTIPLE R =	0.33090
SAMPLE SIZE =	132

Graduate Discipline: Social Sciences (ALTERNATE)
Prediction Model

PREDICTOR	WEIGHT
PSVC	-0.01000802
COMP	+0.19014690
CONSTANT	+3.53305826
MULTIPLE R =	0.39704
SAMPLE SIZE =	47

Graduate Degree: Master of Business Administration (ALTERNATE)

Prediction Model

PREDICTOR	WEIGHT
GMATQ	+0.01340860
CONSTANT	+3.20689611
MULTIPLE R =	0.39201
SAMPLE SIZE =	40

Graduate Degree: Master of Science (ALTERNATE)

Prediction Model

PREDICTOR	WEIGHT
UPRCT	+0.00256206
GREQ	+0.00086881
AGE	-0.04011627
PSVC	+0.01537982
CONSTANT	+3.91463305
MULTIPLE R =	0.54902
SAMPLE SIZE =	51

Graduate Degree: Master of Arts (ALTERNATE)

Prediction Model

PREDICTOR	WEIGHT
GRET	-0.00041826
AGE	-0.02392710
CONSTANT	+4.94628455
MULTIPLE R =	0.39721
SAMPLE SIZE =	61

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Vita

Captain Daniel V. Bruno was born 9 March 1959 in Indianapolis, Indiana. He graduated from Scecina Memorial High School in Indianapolis, Indiana, in 1977 and attended the University of Notre Dame, from which he received the degree of Bachelor of Business administration in May 1981. Captain Bruno received his Regular Army commission into the Adjutant General's Corps through the ROTC program. He served with the 9th Infantry Division, Fort Lewis, Washington, from 1981 until 1985. He concluded his tour there as Commander of the 9th Adjutant General Company. Following his assignment at Fort Lewis and the Adjutant General Officer Advanced Course, he became the Director of the Adjutant General Officer Basic Course at Fort Benjamin Harrison, Indiana. Captain Bruno entered the School of Systems and Logistics, Air Force Institute of Technology, in May 1986. He is married to the former Katherine E. Brown and has two daughters, Sarah Marie and Katherine Elizabeth.

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Block 19. Abstract (Continued)

This study was designed to determine predictors of success for selecting Army officers to attend fully funded graduate school. The objective was to develop prediction models to assist decision makers in selecting the best qualified officers.

The study examined the records of 1201 officers who attended fully funded graduate school during fiscal years 1982, 1983, and 1984. The officers were grouped into either administrative or academic classification categories. Administrative categories included branch, division, and source of commission, and academic categories included graduate discipline, graduate degrees awarded, and graduate school. The study examined the following predictor variables: age, gender, component, active federal commissioned service, prior enlisted or warrant officer service, undergraduate grade point average, class standing, standardized exam scores, (GRE and GMAT), and years since undergraduate degree. The criterion used for this study was graduate grade point average.

Using regression analysis, the study found different predictor-criterion relationships for each classification, as well as a few more broadly applicable predictors. Missing data due to different record-keeping procedures across branches limited the potential usefulness of the results. The significant and meaningful predictors found should encourage career managers to improve their current procedures and begin to maintain information to permit further improvement in selection procedures as data become available.